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SCIENCE AND THE STATE

By Dr. WILLIAM SALANT

NEW YORK CITY

THE revolution in sentiment which is being wrought by the war is perhaps most strikingly illustrated by the public recognition of the value of scientific investigation. The idea is fast gaining ground that science is indispensable for the preservation of modern society and may be considered one of the most profitable lessons taught by the war.

According to a declaration of the British Labor Party the advancement of science is placed in the forefront of its political program. The necessity of scientific development is emphasized by the incorporation into its political platform, of recommendations for the deliberate organization of research. This attitude of a group of radical labor leaders toward scientific activity might well be regarded as highly significant of the trend of thought at the present day. For never before has any political party embodied in its declaration of principles the advancement of science as national policy.

Evidence that the progress of science is no longer to be left to chance is also furnished by the announcement of the British Ministry of reconstruction after the war.

Its plans which were published about two years ago indicate that definite form has been given to the recognition that science is the corner stone not only of modern warfare but also of the future society which is to follow the establishment of peace. Judging from the number and the organization of the various boards and committees the object is to stimulate scientific research along different lines on an unprecedented scale. The scheme of this highly important body includes among other items in its program the appointment of two research boards on scientific and industrial investigations, five standing committees, seven research committees, four inquiry committees and three provisional organization committees. Official recognition of scientific investigation was not confined, however, to the British Isles. The colonies have also realized the necessity of scientific investigation as was shown by the establishment of a similar organization in Canada at the head of which is the well-known physiologist Professor A. B. McCallum. It is pertinent

to inquire therefore what our federal government is doing in the way of promoting scientific investigation especially of the type which will be needed after the war. As it is necessary to look into the future and make provision for the solution of various problems which will arise when peace is established a review of the scientific activities of the government and the conditions of scientific work may, therefore, be helpful in preparing for the greater task which is to come, for the analysis of conditions may suggest changes that will lead to necessary improvements in an important branch of the service which has within recent years assumed large proportions. It is not generally realized that the federal government has for years employed a number of agencies for carrying on scientific work of every description. This activity of the federal government is very significant, as it indicates recognition by the American public of the need of scientific work for the solution of practical problems. It shows the realization by the average citizen that science is a necessity and is entitled to support by the government. This has for years been strongly reflected in the liberal appropriations made for this purpose by Congress.

According to Van Hise the appropriation in most federal organizations varied in 1911 from \$100,000 to \$1,000,000. The total amount per annum available for investigation and supplies was more than ten times as much as any single university or institution in the country spent for this purpose. This did not include the appropriation for the Department of Agriculture, which in 1911 spent twenty million dollars, a large part of which went for scientific and extension work. This appropriation for the Department of Agriculture has since been greatly augmented. For a number of years this department has been receiving enormous sums from the treasury for scientific work. Every science was represented. Every branch of chemistry, human and veterinary medicine, botany, zoology, agriculture and economics were included in its official statement. The estimated cost of the various scientific undertakings for 1917 was over four million dollars, nearly all of which was to be devoted to the various sciences as related to agriculture in all its ramifications. Examination of the program of work published by Department of Agriculture shows that the solution of a very large number of problems have been attempted and still more are contemplated. It may be pointed out that the annual appropriations for research in the various bureaus for 1917 varied between \$60,000 and \$1,645,640. Moreover the appropriations do not include large amounts spent for routine testing

which has to be carried out in connection with the regulatory work of the department. Very often problems suggest themselves when routine tests are made and demand solution. Appropriations of very considerable size are also made annually for statistical work and for the study of various economic problems. The sum of four million dollars mentioned above does not represent, therefore, the entire amount spent in investigation and research in that department. To this sum must also be added the upkeep of buildings and libraries, and the money invested in the equipment of laboratories. Large appropriations for scientific work in other departments have been made by Congress during the last few years immediately preceding our entry into the war. The Bureau of Standards, the Bureau of Mines, the Bureau of Fisheries, the Naval Observatory, the Geological Survey and other government bureaus have been granted large sums of money for scientific work. It is difficult to quote in figures the exact amounts devoted to research in each case as they very seldom appear in the official records. But the Geological Survey received in 1916 \$40,000 for physical and chemical research. Since it is well known to scientific men that research forms part of the activity of these organizations it is reasonable to infer that the total amount of money spent annually for scientific investigation in all the departments of the government must be considerable, though, by no means, so large as that devoted to similar purposes by the Department of Agriculture. The achievement of scientific results is, therefore, a matter of much concern to the public. Their practical importance can not be overestimated since the various undertakings were intended to meet the daily needs of our life. To what extent agriculture, sanitation, preventive medicine and other public activities will be benefited, only those familiar with the problems in the numerous laboratories can fully realize. The possibilities inherent in the opportunities offered for making contributions of great value to the stock of useful knowledge are practically unlimited. It is realized, however, by those conversant with the actual state of affairs that advantage is not taken of the opportunities to the extent that it should, as science neither pure nor applied derived the benefit which might be expected.

It has indeed been pointed out several years ago by Van Hise that the advancement of science in its broader aspects is contributed to by only a few of the scientific bureaus at Washington. The Geological Survey, he remarked, was for a number of years the center of the world for the "advancement of the

science of geology but it is not contributing in any large degree to the advancement of science at present." Such a statement coming as it does from an eminent geologist who had for years been associated with Geological Survey is very significant, as it shows a state of affairs which should not exist. Unfortunately his statement still applies to some bureaus at present. The wide recognition by the public that scientific investigation is a necessity and that the application of the results of research are essential to the very existence of a great nation make it apparent that the conditions surrounding scientific investigation and research in the federal government should not be a matter of indifference to the public and should form an object of especial interest to all scientific workers in the country. This claim upon their attention applies with even greater force to men of science at this hour, for after our entry into the war the number of scientific projects undertaken by the different government agencies markedly increased. Besides, there is every indication that scientific activity, carried on under the auspices of the federal government, is destined to assume much larger proportions during the period of reconstruction than before the war. The number of scientific workers in the employ of the government promises, therefore, to become permanently large and the problems they may be called upon to solve are likely to be more serious and more numerous in the future than they have been in the past. The treatment of scientific workers, particularly those who have demonstrated their ability to carry on and to direct investigation deserves special attention, for upon them largely depend the objects to be achieved. Proper treatment at the hands of bureau chiefs and heads of departments is essential to success in research. The necessity of improving the conditions of scientific work should be recognized, therefore, and the much-needed reforms should be introduced without delay. Initiative should be permitted and encouraged. There is nothing in our form of government to prevent it. The numerous, petty and annoying regulations should be abolished, as they defeat the very object for which laboratories are established. The establishment of an agency to carry into effect a certain project carries with it by implication authority to employ the methods necessary for the achievement of results. It would, indeed, be considered unreasonable to expect results without the necessary physical equipment employed in the experimental sciences. The need of instruments and apparatus is readily admitted and is usually provided. This applies with even greater force to the intangible conditions in the absence of

which scientific work is either wholly impossible or is at best extremely difficult. The need of a free hand to achieve results when any serious project is undertaken is fully recognized and it is, of course, to be assumed that scientific work in the government is and should be made a serious matter. The condition of the heads of laboratories is especially worthy of attention, for upon them rests the responsibility for carrying out the various scientific projects and it is they who are accountable for the results. Practically all of them are near or past middle age and the possibilities of their being called to fill similar positions elsewhere is very remote. If the tenure of office is so uncertain, as shown by a recent case in the Bureau of Chemistry, that their services may be terminated at any moment and on the slightest pretext, directors of laboratories and their associates are wholly at the mercy of their superior officers. Such conditions are absolutely incompatible with the proper performance of duty and the achievement of scientific results and besides compromise the dignity and self-respect of scientific men. Except under very unusual circumstances, as when the head of a laboratory, or a man in charge of a project is not wholly dependent upon his position for a livelihood, the discharge of his official and professional obligations with any degree of satisfaction to himself and in obedience to the interests of his real employer—the public—becomes almost an impossibility. It is not necessary to dwell upon the influence which such conditions will exert upon the morale of the individual concerned and, therefore, upon his scientific work. The result is necessarily and inevitably disastrous. A policy whereby scientific workers of every grade and description would be shown consideration is urgently needed in every bureau and demands immediate attention. Recognition of merit by promoting the industrious and efficient as well as the recognition that a scientific worker, in whatever capacity employed, has rights that a superior officer is bound to respect, under pain of disgrace and dismissal, would keep intact the organization of useful and productive laboratories. This could be accomplished without added expense and would be beneficial to the public service directly by increasing the volume of scientific work and improving its quality, and indirectly by affording thorough scientific experience to young men and women. Increase of appropriations are hardly necessary to carry into action such a policy, but what is more important is the inauguration of a policy looking forward to the transformation of every unit in every bureau into a harmonious effective organization. But to carry out such a policy men of

marked ability and devotion to the cause of science and to the highest interests of the public are needed. The important fact can not be overlooked that one of the lessons of the early days of the present war was that no nation can afford to neglect its scientific workers or to allow its research agencies to be disorganized and wasted. The most patriotic service that can be rendered is to be ready with our laboratories fully equipped and working at their highest possible efficiency. The reconstruction of our national industries to meet the needs of the world's food supplies and the world's industries, as well as to meet the competition of other nations will demand that American men of science be ready as they have never been before to match their research skill against that of the whole world, which necessitates that our government should lead in every branch of scientific work. Its organization of science should be a model to the country and to the whole world, as otherwise we may be outstripped by other nations in industry and in commerce. While private philanthropy has done much for science in this country it should not be forgotten that the government with its unlimited resources can do vastly more than can ever be accomplished by the wealthiest and most generous individuals. Scientific research is a very expensive undertaking. The cost of some of the constituent laboratories of the Rockefeller Institute and of the Carnegie Institution is between forty and fifty thousand dollars a year. The multiplication of such laboratories will undoubtedly become a necessity in the near future. Is it not too much to leave the development of science to chance and to the generous impulses of men of wealth? Besides it is hardly conceivable that private philanthropy will be equal to the occasion in the future for the scientific undertakings promise to be so vast that the government alone will be equal to the task. The movement in this direction is, however, not new for this country. Public opinion will undoubtedly approve of more thorough organization of science by the government and of more liberal support for it in the future than in the past. There is every reason to expect that we can accomplish even more in this direction than the other nations, since our resources are practically unlimited.